

UNIVERSITY OF DALLAS

The Catholic University for Independent Thinkers

Biostatistics- Bio 3345

Professor

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Course Overview

Introduction to Biostatistics provides an introductory overview of selected important topics in biostatistical concepts and reasoning. This course represents an introduction to the field and provides a survey of data and data types. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; issues of power and sample size in study designs; and random sample and other study types. Course work includes statistical analysis using the computer, homework assignments, case studies using demo datasets, and a final course project presenting results of analysis of biological data

Office Location

Haggerty Science Bldg.
Rm #141

Office Hours

By appointment

Course Objectives

Upon completion of the course, students should be able to:

- 1) Recognize and give examples of different types of data arising from Biological context (including public health and clinical studies)
- 2) Interpret differences in data distributions via visual displays
- 3) Calculate standard normal scores and resulting probabilities
- 4) Calculate and interpret confidence intervals for population means and proportions
- 5) Interpret and explain a p-value
- 6) Perform a two-sample t-test and interpret the results; calculate a 95% confidence interval for the difference in population means
- 7) Select an appropriate test for comparing two populations on a continuous measure, when the two-sample t-test is not appropriate
- 8) Understand and interpret results from Analysis of Variance (ANOVA), a technique used to compare means amongst more than two independent populations
- 9) Choose an appropriate method for comparing proportions between two groups; construct a 95% confidence interval for the difference in population proportions
- 10) Describe different types of studies
- 11) Understand confounding and interaction in studies
- 12) Apply the use of Tableau and Excel to manipulate basic trends from a given dataset

Required Text

Introductory Biological Statistics, 3rd Edition, Waveland Press Inc. 2014 by *Raymond E. Hampton and John E. Havel*

Course Materials

All materials for homework assignments will be provided by the instructor. Additional resources are listed below for project assignments and homework references.

Software Resources

The following software will be essential components of the course. Students will be given access to these on classroom computers for completion of their work. Students are encouraged to download Excel with the data analysis add-in option on their personal computers as well if they wish. If you do not yet have MS Office, you can get a free copy of Office 365. Please send a blank email from your UD email account to ssanyal@udallas.edu with the subject line **Office 365 for Students**. MS Office includes MS Word, PowerPoint, Excel, etc.

- Microsoft Excel (add-in feature called “data analysis” package)
- Tableau (This course has a dedicated website which can be accessed freely from the link below*)

<https://us-east-1.online.tableau.com/#!/site/drtobyudallasbiostatisticsbio3345/workbooks>

**Each student will be added as a user and granted access to the course website during the first session*

Attendance Policy: This course adheres to the attendance policy as described in the University Bulletin

Class attendance is assumed. Unexcused absences from three class hours in any one course shall be reported to the Registrar, who then warns the student. If any further unexcused absences occur, an instructor may, at any time before the last day of classes, require that the student be withdrawn for excessive absences by notifying the Registrar in writing. A "W" is assigned through the withdrawal deadline, generally the 10th week of class. After the withdrawal deadline an "FA" is assigned. The Registrar notifies the student of the instructor's action and invites the student to consult with the instructor. The instructor's decision is final.

Student Absences due to Athletic and University-Sponsored Events: Students who are absent from classes for games and travel-related athletic and other University-sponsored events approved by the appropriate academic Dean should not be penalized for these absences under the following conditions:

- The student has met with the instructor to discuss upcoming classes for which there are conflicts with a university event. This meeting should be as far in advance as possible (typically by the second week of class for events already scheduled for the semester).
- The student has not missed more than three hours of class time in a three-credit hour course (and similarly and proportionally for courses with fewer or more credit hours).

If the absence requires make-up work, the instructor should work with the student to make reasonable arrangements for the missed work, classes, and examinations. The student is responsible for completing the make-up work on time. This policy does not extend the number of days students may miss class; the cap for missed days is set by the Class Attendance Policy, which is currently 3 hours for a three-credit hour class.

Late Work

Projects must be turned in on the due date during the last week of class once they've been presented in class. students are solely responsible for ensuring they turn in the correct assignment in person or by email to itoby@udallas.edu. All digital assignments must be attached to an email clearly stating the file format and the program used to read the file. Incorrect assignments, failure to attach the appropriate file, invalid file formats, and corrupt files will be considered incomplete and fall under the later work policy. Points will be deducted from projects for each 24-hour period they are late.

Special Accommodations

If you have a documented condition (e.g., physical or learning disability) requiring a special accommodation, it is your responsibility to provide the instructor with the proper documentation. If you have any questions about this or believe this applies to you and still need to set up accommodations with UD, please contact Jeffrey Taylor by email at ada@udallas.edu or by phone at 972-721-5385. You can also access the accommodation form online at: <http://www.udallas.edu/aboutus/offices/hr/ada/accommodation>

Homework Policy

Homework problem sets will be assigned from the textbook and posted in Brightspace. These assignments are not graded and do not count towards your final grade. However, it is highly suggested that you attempt these problem sets as they are strong indicators of quiz and exam questions.

Grading:

Grading Criteria

| Item | Percentage |
|-------------------|------------|
| Quizzes (4 total) | 25% |
| Final Project | 25% |
| Midterm | 25% |
| Final Exam | 25% |
| Total | 100% |

Standardized Grading Scale

| Grade | Grade Points | 100-Point Scale* |
|---|--------------|---|
| A | 4.0 | 93-100 |
| A- | 3.7 | 90-92 |
| B+ | 3.3 | 87-89 |
| B | 3.0 | 83-86 |
| B- | 2.7 | 80-82 |
| C+ | 2.3 | 77-79 |
| C | 2.0 | 73-76 |
| C- | 1.7 | 70-72 |
| D+ | 1.3 | 67-69 |
| D | 1.0 | 63-66 |
| D- | 0.7 | 60-62 |
| F | 0.0 | ≤ 59 |
| FA | 0.0 | Failure because of excessive absences or failure to withdraw from the course. |
| *As a percentage of total points possible for the course. | | |

Course Schedule (Tentative*)

| Week | Subject | Reading and Practice Problems |
|----------|--|-------------------------------|
| W Aug 22 | Introduction to Biostatistics and Data | Chapter 1 and 2 reading |
| F Aug 24 | Exploring data types and intro to tools (I) | Homework Set #1 |
| M Aug 27 | Exploring data types and intro to tools (II) | |
| W Aug 29 | Descriptive Stats (I) | Chapter 3 and 4 reading |
| F Aug 31 | Descriptive Stats (II) and Microsoft Excel | |
| M Sep 3 | Labor Day holiday | |
| W Sep 5 | Data analysis: Hands-on exercises | Homework Set #2 |

| Week | Subject | Reading and Practice Problems |
|----------|--|---|
| F Sep 7 | Descriptive Stats (III) | Quiz #1 |
| M Sep 10 | Intro to hypothesis testing (I) | Chapter 5, 6, and 7 reading |
| W Sep 12 | Intro to hypothesis testing (II) | |
| F Sep 14 | Distributions of data | Chapter 8 reading |
| M Sep 17 | Data analysis: Hands-on exercises | Homework set #3 |
| W Sep 19 | Single population mean (I) | Chapter 9 reading |
| F Sep 21 | Single population mean (II) | |
| M Sep 24 | Two-population mean (I) | Chapter 10 reading |
| W Sep 26 | Two-population mean (II) | |
| F Sep 28 | Review for midterm exam | Quiz #2 |
| M Oct 1 | Intro to Tableau | Homework set #4 |
| W Oct 3 | Data analysis: Hands-on exercises | |
| F Oct 5 | Fall reading day (holiday) | |
| M Oct 8 | Midterm period; case studies | |
| W Oct 10 | *Midterm | |
| F Oct 12 | Midterm period; case studies | |
| M Oct 15 | Analysis of variance (ANOVA) | Chapter 11 and 12 reading |
| W Oct 17 | Non-parametric testing | Chapter 13 reading |
| F Oct 19 | Data analysis: Hands-on exercises | Quiz #3 |
| M Oct 22 | Correlation and Regression (I) | Chapter 13 and 14 reading |
| W Oct 24 | Correlation and Regression (II) | |
| F Oct 26 | Data analysis: Hands-on exercises | |
| M Oct 29 | Experimental design (I) | Chapter 15 reading |
| W Oct 31 | Experimental design (II) | |
| F Nov 2 | Data analysis: Hands-on exercises | |
| M Nov 5 | Case studies of Biological data | Homework set #5 |
| W Nov 7 | Data analysis: Hands-on exercises | |
| F Nov 9 | Contingency tables, Power analysis and p-value | Supplemental materials (refer to Brightspace) |

| Week | Subject | Reading and Practice Problems |
|----------|-----------------------------------|---|
| M Nov 12 | Current trends in Biostatistics | Supplemental materials (refer to Brightspace) |
| W Nov 14 | Demo data discussions | Quiz #4 |
| F Nov 16 | Demo data discussions | |
| M Nov 19 | Thanksgiving break | |
| W Nov 21 | Thanksgiving break | |
| F Nov 23 | Thanksgiving break | |
| M Nov 26 | Data analysis workflows | |
| W Nov 28 | Final Project presentations | |
| F Nov 30 | Final Project presentations | |
| M Dec 3 | Final Project presentations | |
| W Dec 5 | Last day of classes (Exam review) | |
| M Dec 10 | *Final exam | |

**This syllabus is subject to change at the discretion of the instructor. Whenever possible, students will be consulted, and advance notice will be provided for any changes.*

Additional Information

The final project is expected to be a culmination of individual work based upon hands-on exercises and students' presentation of data analysis output from analysis performed using datasets provided by the professor. The grading rubric to be utilized for this final project will be posted on Brightspace for further guidance.